TESTING THE PET COMPUTER
commodore
PET™
2001 Series
personal
compute

Testing the PET Computer

The PET Test includes a cassette tape containing four diagnostic programs and the diagnostic connector. Let's first look at these two.

The *program list* includes the ROM test, the memory poker, the data checker and screen alignment. They're recorded redundantly and, in the case of memory and data, for both the 4K and the 8K units. The exact sequence can be found below.

The diagnostic connectors, one connected to the keyboard connector and the other to the user port, enable you to conduct the diagnostic routine resident in the ROM.

You will now be able to check out:

- all RAM chips
- the parity of ROM
- the keyboard circuit
- the TV display logic
- the read/write of both cassette ports
- the user port
- the I.E.E.E. 488 port

Program List for Diagnostic Test Tape

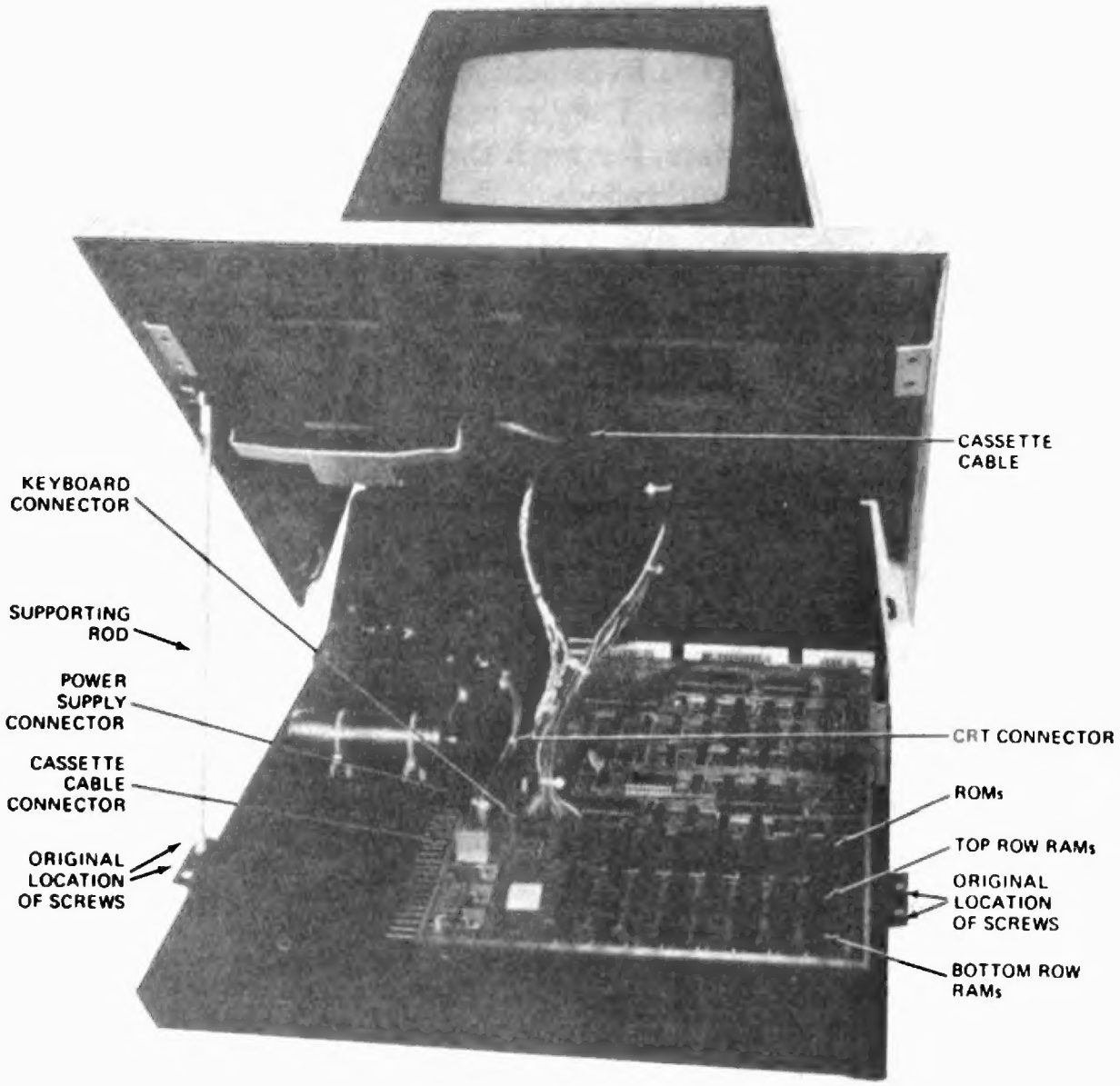
1. ROM Test
2. ROM Test
3. ROM Test
4. 4K Memory POKER
5. 4K Memory POKER
6. 8K Memory POKER
7. 8K Memory POKER
8. 4K Data Checker
9. 4K Data Checker
10. 8K Data Checker
11. 8K Data Checker
12. Screen Alignment
13. Screen Alignment

I. Diagnostic Routine — Using the Diagnostic Connectors

A. Opening the PET Computer.

1. Press the rocker switch to the "Off" position.
2. Remove the power cord from the wall socket to avoid possible electrical shock.

3. Remove the two screws located on each side of the unit under the lip of the cover.



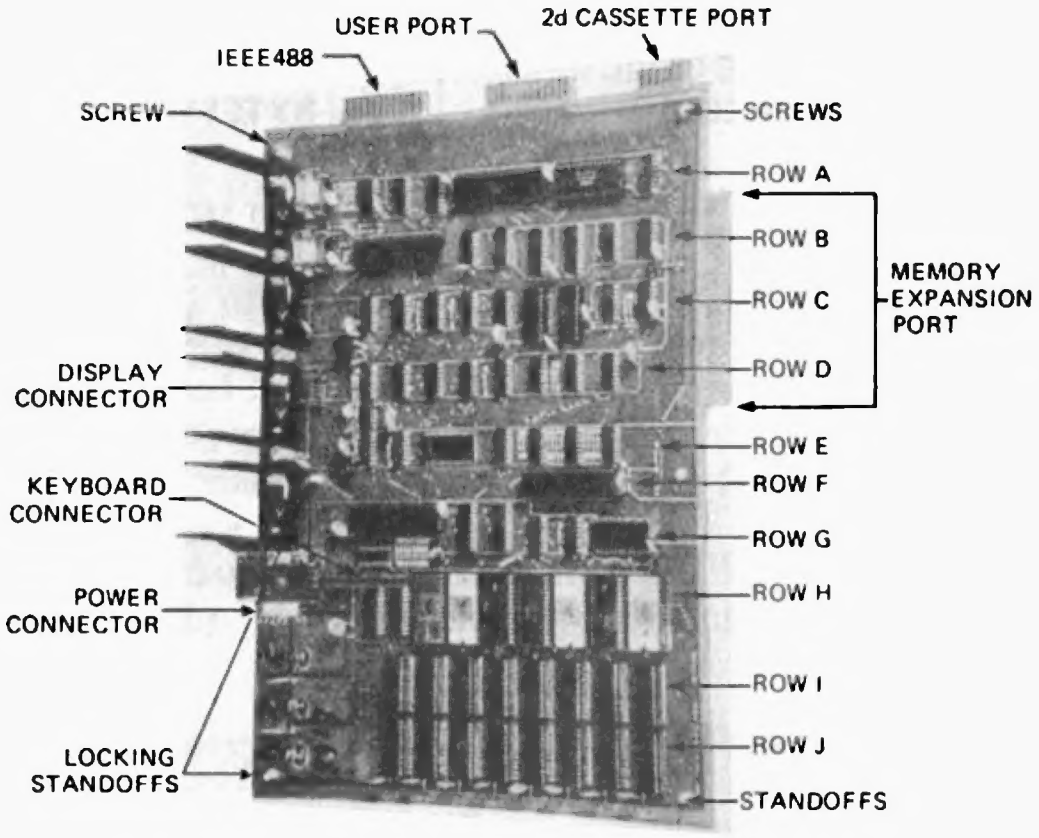
4. Lift the cover slowly—a few inches. When you locate the cable leading to the cassette, remove the connector at the main board. Then lift the cover all the way up and engage the supporting rod located on the left side of the cover.

B. The Diagnostic Connectors

1. Remove the keyboard cable from the connector on the main logic board.

2. Insert the proper diagnostic connector into this connector.

3. Insert the other connector into the user port. Make sure of power polarity.



ROW A CHARACTER GENERATOR ROM 6522 VIA
ROW B TIMING CHIPS AND 6520 PIA
ROW C BUFFERS AND TIMING
ROW D BUFFERS AND TIMING
ROW F MPU
ROW G 6520 PIA AND TIMING
ROW H ROMs
ROW I RAMs
ROW J RAMs

C. The Diagnostic Routine

1. Turn on the PET.
2. The routine will now clear the screen. (The red LED on the main board should not be on.)
3. The cursor should now begin to sweep across all locations on the TV screen.
4. When the cursor leaves the screen at the bottom right, the display will fill with a full character test pattern. Use this test pattern to check visually for all characters; make sure that no bits are flickering on the screen.
5. The red LED should now be lit indicating the main logic board has passed the diagnostic test.

D. Completing the Diagnostic Routine: Extended BASIC Test

1. Turn off the PET. Remove the keyboard diagnostic connector and reconnect the keyboard cable. Remove the diagnostic connector from the user port. Close the unit and turn the PET back on.
2. The TV display should clear and then display the following:

FOR 8K MODELS

```
***COMMODORE BASIC***
7167 BYTES FREE
READY ·
■
```

FOR 4K MODELS

```
***COMMODORE BASIC***
3067 BYTES FREE
READY
■
```

E. Removing the Logic Board

In the event that the logic board needs to be replaced, please note that the board is secured by three (3) screws and three (3) locking standoffs.

1. Remove all connectors to the board.
2. Remove the three screws.
3. Unlock the stand-off while pulling the board up off the standoffs.

NOTE: The following series of four tests will be in conjunction with the diagnostic program tape.

II. The ROM Test

A. Procedure for Loading

1. Open the cassette drive cover and place the cassette in just as you would a normal audio cassette.
2. Type in LOAD, or hold down the [SHIFT] key and touch and release the [RUN/STOP] key. (Either way your screen should show **LOAD**.) If you typed in **LOAD**, now type in RUN.
3. Press the key labeled "PLAY" on the cassette unit.
4. Your screen should now show:

```
LOAD
PRESS PLAY ON TAPE #1
OK
SEARCHING
FOUND PROGRAM (program name)
LOADING
```

5. Let the program run until the PET is warmed up (approximately fifteen minutes).

B. Verification

This test will verify all ROM chips. If there is a failure, a number will appear to the right of the cursor. The number on the screen refers to

the position of the defective ROM (1 to 7) which will always appear in row H. Now, shut off power, replace the defective ROM, and turn the power back on.

C. Repeat Test

In the event a ROM has proved to be defective, repeat the test. This will assure you that no other ROMs are defective. It's also a safeguard: a defective ROM can make the program invalid; repeating the test will overcome this.

To repeat the test, repeat steps 1, 2, 3, and 4 in Procedure A above. (Remember that there are *three* consecutive ROM Tests on your diagnostic program tape. Had there been only one, you would have to first rewind the cassette and start again).

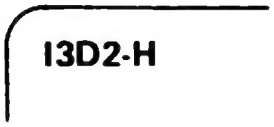
III. The Memory Test (Memory Poker)

A. Procedure for Loading

1. Follow the general method for loading as outlined previously. But this time, type LOAD "8K MEMORY POKER" (or 4K Memory Poker, if you're testing a 4K). This will allow the PET to skip through ROM TESTS #2 and #3, and the 4K Memory Poker, if you're testing the 8K. See the program list on page 1. Then type in RUN.
2. Allow the program to run at least 1000 seconds (approximately seventeen minutes).

B. Locating Defective RAM

If a failure occurs, the location of the defective RAM will be displayed on the screen in this fashion (as an example):



Where the first character (I) is the row, the second (3) is the position in the row. Both are printed on a reverse field. The D refers to data and the next digit indicates the data bit. (The second data bit in this case.) The last character (H or L) refers to the failure condition (High or Low).

C. Replace the Defective RAM

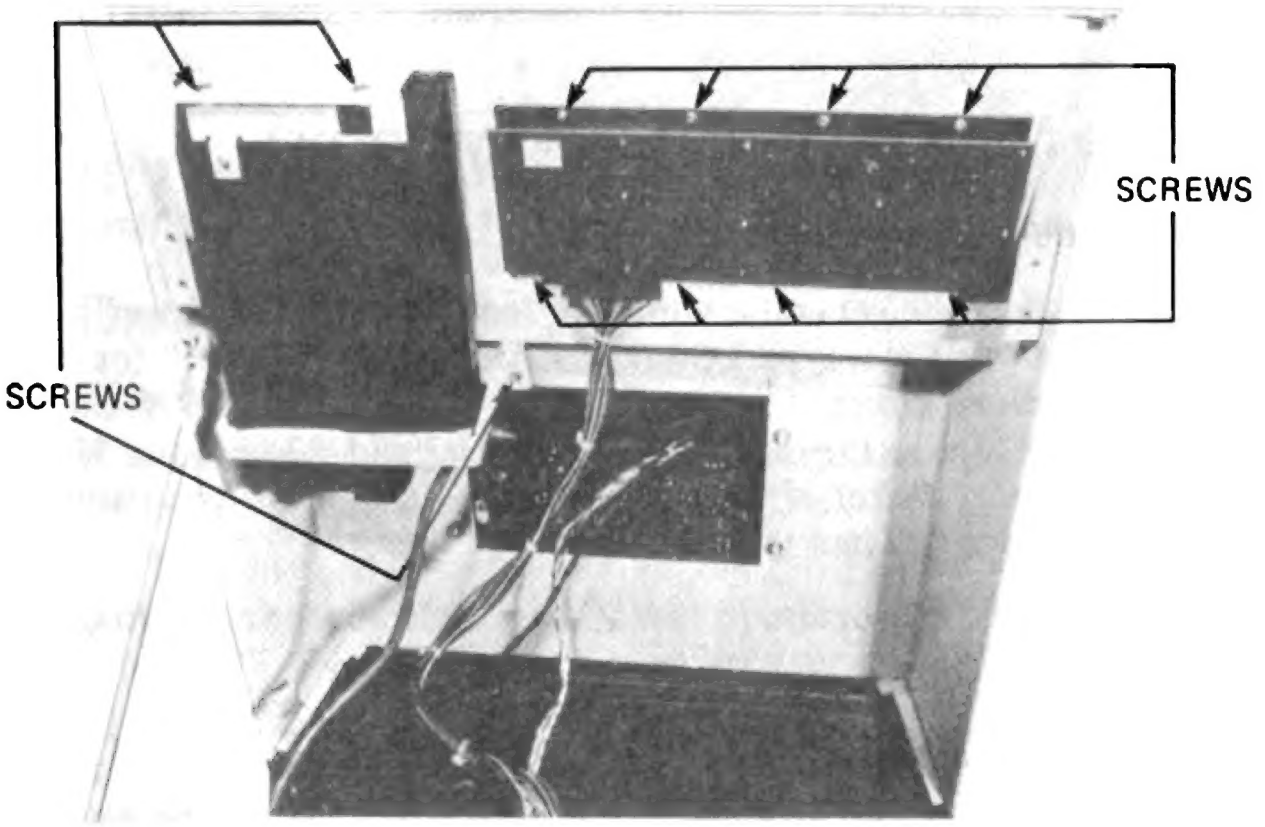
D. Repeat Test, following the same procedure as in II C.

IV. The Data Checker (Cassette Test)

A. Procedure for Loading and Testing

1. The cassette mechanism should be checked for proper mechanical operation. Insert a cassette in the player. Test rewind and fast forward functions. Test play and stop button. Listen for any loud rubbing or grinding noise. Finally, test the eject function of the cassette mechanism.

   Before you verify the read/write capability of the cassette player, follow the procedure on "Cleaning and Demagnetizing Tape Deck Head" as indicated in "An Introduction to Your PET" book.



2. Attach the second or external cassette drive to the port in the rear right corner of your PET.
3. Following the procedure outlined previously in II A, type in

   LOAD "8K DATA CHECKER"

   (or 4K. as the case may be).

4. Let program cycle and check for errors.
5. Remove cassette program, insert a rewound blank tape. Type

   SAVE "PET #" **RETURN**

   (The # may be any that you choose.) The PET should display

```
PRESS PLAY AND RECORD ON TAPE #1.
```

Hold REC (record) button down on cassette drive while engaging the PLAY button. The PET BASIC will save this program on the blank tape under the new name.

6. When cursor returns to the display, stop the cassette drive and rewind the tape.
7. Type

   VERIFY [RETURN]

B. Verification—First (Built-in) Cassette

1. The PET BASIC should find and verify the program just saved on Tape # 1. Check the name of the verifying program. It should be the name it was saved under. The "VERIFY" should finish with an OK.

   a. If the screen displays

   ```
   ? VERIFY ERROR
   ```

   there could be a tape or memory retention problem.

2. Type

   PEEK (630) ,ST [RETURN]

   Two numbers should appear in the display. The first number represents the amount of drop-out times 2 and should be less than, or equal to, 4. The second number represents the status word and should be zero.

   a. The cassette read/write capability has been verified with the external cassette application.

C. If First Cassette Malfunctions:

1. Test cassette drive by disconnecting male connector of cassette on logic board. Substitute a tested cassette drive.
2. To remove the cassette assembly entirely, remove cassette connector from main board, loosen the two screws on the rear bracket, and remove the two screws located in the front of the unit.

D. Testing Second (External) Cassette Drive)

1. Remove tape from built-in cassette drive and transfer to the external cassette drive.

2. Type

   VERIFY " ",2 [RETURN]

3. When the display reads

   do so.

4. Follow same verification procedure as B, above.

V. Screen Alignment

A. Procedure for Testing

1. Type

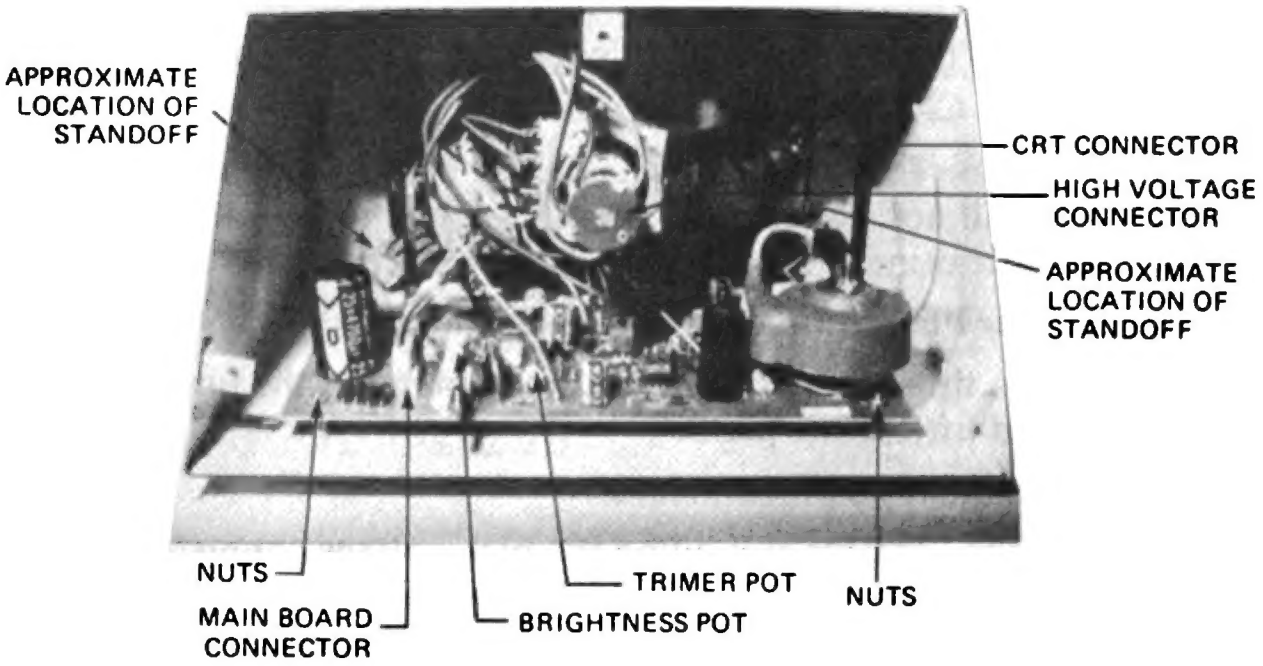
   LOAD "SCREEN ALIGNMENT"

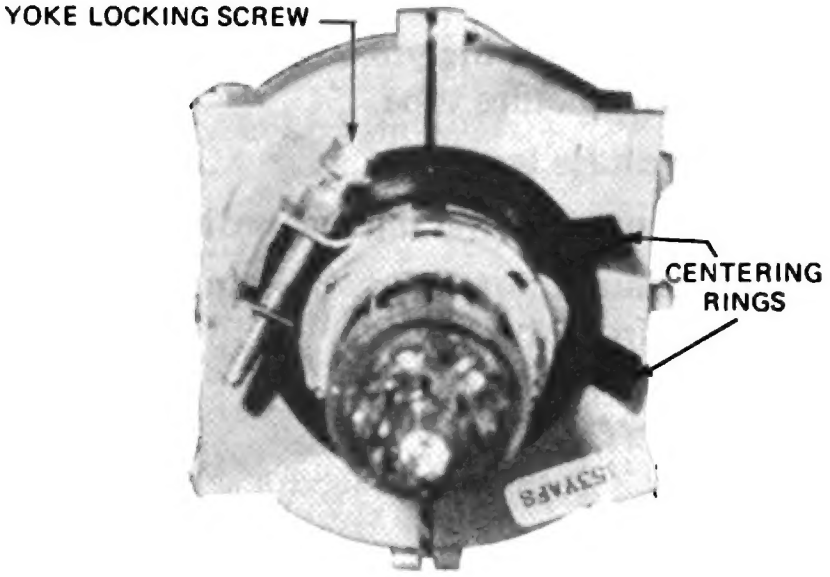
2. The GET command in BASIC will offer three choices in display: 1, 2, or 3.
   a. 1 is the checker board across the entire screen.
   b. 2 is a crisscross pattern across the entire screen . . . for alignment.
   c. 3 creates a pattern of @ signs and represents 0 in the binary memory code.

B. Observation and Correction

On the basis of the condition observed, as set forth below, this is what the correction should be:

1. Vertical size too large (can't see top or bottom lines).
   a. Correction: Located to the right and back of the display assembly is a white trimmer pot standing on end with a slot on it. Turn the slot clockwise or counterclockwise until you achieve the proper size.
2. Screen is slanted.
   a. Correction: Loosen the locking screw on the yoke assembly. Rotate the yoke clockwise or counterclockwise until you achieve proper alignment.
3. Screen not centered.
   a. Correction: The yoke assembly has 2 metal rings with taps located in the center of the yoke. By rotating one or both rings, move the picture in a circular pattern. Adjust until screen is centered.





You have now completed the diagnostic routines using the connectors and the cassette program. You've tested virtually everything, except the keyboard and the cassette mechanism.

VI. The Display Assembly

CAUTION: THE DISPLAY CIRCUIT GENERATES 10,000 VOLTS D.C. EXTREME CARE MUST BE USED.

On the assumption that the display is faulty, here's how to remove the assembly. We will not discuss how the *testing* of the assembly per se; the diagnostics routine should have given us all the needed information

A. Unplug your PET from any electrical outlet.

B. Remove the three screws from the cover plate on the upper housing and lift off the plate.

C. Unplug the main board connector.

D. Discharge the CRT by grounding the high voltage connector: connect a clip lead from the brightness pot. lead to the shank of a thin bladed screwdriver (with a well-insulated handle). Then, with the blade of the screwdriver, reach beneath the plastic cover on the side of the tube.

E. Unplug the CRT connector by pulling it straight back from the CRT.

F. Turn the locking screw on the yoke until it is loose. Pull the yoke straight back off the picture tube.

G. Unplug the high voltage lead.

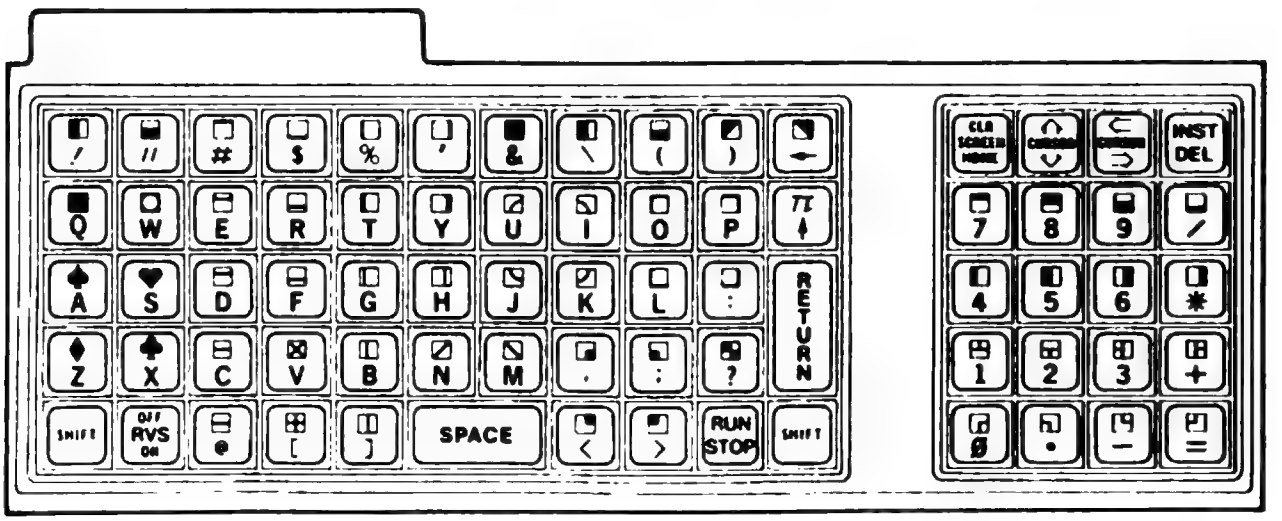
H. Remove the two nuts securing the display board.

I. Lift the display board up off the two plastic locking standoffs and remove the board from the housing.

VII. The Keyboard

A. Testing.

Verify all keys are operational and that each character on the keyboard corresponds to the display.



2. Type the following sequence of characters and verify that they appear on the screen:

```
! // # $ % ' & / ( ) ←
Q W E R T Y U I O P ↑
A S D F G H J K L :
Z X C V B N M , ; ?
@ [ ] < >
7 8 9 / 4 5 6 * 1 2 3 + 0 . - =
[SPACE] [RETURN]
```

PET should respond with

```
? SYNTAX ERROR
READY.
```

3. Type this line

   ? " [CLR HOME] AND [SHIFT] [CURSOR ↓] [CURSOR →] [OFF RVS] AAA [RETURN]

   Screen should clear and show

```
AAA
READY.
```

B. Malfunctioning

1. Assuming there is a keyboard fault, replace the keyboard with one you're sure of.

   a. The keyboard is secured with eight screws. Remove these, then press firmly down on the keyboard until assembly comes loose.

2. If unit still malfunctions, assume the logic board is at fault.

   b. The board is secured by three screws and three locking standoffs. Remove all connectors to the board. Remove the three screws. Unlock the standoffs while pulling the board up off these standoffs.

VIII. Testing Upper and Lower Case

A. Type POKE 59409, 52

1. The TV display should go blank.

B. Reset the PET by turning power switch off then on.

C. Type

♦♦♦ZZZ

(*♦ is the shifted Z*)

(*Use cursor to go down and to the left*)

POKE 59468,14 RETURN

the row of characters should change to

zzzZZZ

D. Now type

POKE 59468,12 RETURN

The row of characters should once again read

♦♦♦ZZZ

ERRATA
Testing The PET Computer

Page 1, Paragraph 5 should read:

1. ROM Test
2. ROM Test
3. ROM Test
4. 4K Memory POKer
5. 4K Memory POKer
6. 8K Memory POKer
7. 8K Memory POKer
8. 4K Data Checker
9. 4K Data Checker
10. 8K Data Checker
11. 8K Data Checker
12. Screen Alignment
13. Screen Alignment
14. 019 ROM Test
15. 019 ROM Test

Page 7, Item B2 should read:

Type

? PEEK(630) , ST [RETURN]

Page 11, Item 3. should read:

Type this line:

? " [SHIFT] AND [CLR HOME] [CURSOR ↓] [CURSOR →] [OFF RVS] AAA [RETURN]

Page 5, should be added to Item 3B:

When testing with 2114 RAMs

The position in the rows will be reversed, if the screen shows 13D2-11 then the defective RAM is in position 16 and not in position 13.

Page 4 11, 5:

NOTE: If test shows ROM 111 defective, you are probably not using the correct ROM Test. Load 019 ROM Test in and note if ROM 111 shows defective again.

Commodore Business Machines, Inc.
901 California Avenue
Palo Alto, California 94304, USA

Commodore/MOS Technology
Valley Forge Corporate Center
950 Rittenhouse Road
Norristown, Pennsylvania 19401, USA

Commodore Business Machines Limited
3370 Pharmacy Avenue
Agincourt, Ontario, Canada M1W2K4

Commodore Business Machines Limited
Eaglescliffe Industrial Estate
Eaglescliffe, Stockton on Tees
Teeside TS 160 PN, England

Commodore Business Machines Limited
360 Euston Road
London NW1 3BL, England

Commodore Büromaschinen GmbH
Frankfurter Strasse 171-175
6078 Neu Isenburg
West Germany

Commodore Japan Limited
Taisei-Denshi Building
8-14 Ikue 1-Chome
Asahi-Ku, Osaka 535, Japan

Commodore Electronics (Hong Kong) Ltd.
Watsons Estates
Block C, 11th floor
Hong Kong, Hong Kong

Copyright 1978 by Commodore Business Machines Inc.